

INTERNATIONAL SPACE DEVELOPMENT CONFERENCE 2010
Abstract Submission for Paper and Presentation

Name of Presenter: David Smitherman

Address: NASA Marshall Space Flight Center
ED04, Advanced Concepts Office
Huntsville, AL 35802

Telephone: (256) 544-2053

Fax: (256) 544-2053

Contact Email: David.Smitherman@nasa.gov

Company: NASA Marshall Space Flight Center

Presentation Title: Habitation Concepts and Tools for Asteroid Missions and Commercial Applications

Estimated time of Presentation: 22 minutes

Anticipated audiovisual requirements: PowerPoint Slides

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Do you expect to submit a formal Paper? Yes

Relevant professional background or experience:

Mr. Smitherman is a technical manager of future space projects in the Advanced Concepts Office at the NASA Marshall Space Flight Center. He holds a Master of Science in Space Architecture from the University of Houston, and Bachelor of Architecture and Bachelor of Science in Environmental Design degrees from Auburn University. From 1993 to 1997 Mr. Smitherman worked as a planner on numerous aerospace projects including Space Station redesign, Space Station contingency planning, and various ISS payloads. Since 1998 he has been a study manager for numerous advanced concepts studies, including Space Business Parks, New Space Industries, Space Elevators, and Propellant Production Depots. Current activities include support to the Altair Lander, Lunar Surface Systems, and other exploration mission concepts for habitation design, environmental control and life support system requirements, and radiation protection standards.

HABITATION CONCEPTS AND TOOLS FOR ASTEROID MISSIONS AND COMMERCIAL APPLICATIONS

David Smitherman

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Abstract

In 2009 studies were initiated in response to the Augustine Commission's review of the Human Spaceflight Program to examine the feasibility of additional options for space exploration beyond the lunar missions planned in the Constellation Program. One approach called a Flexible Path option included possible human missions to near-Earth asteroids. This paper presents an overview of possible asteroid missions with emphasis on the habitation options and vehicle configurations conceived for the crew excursion vehicles. One launch vehicle concept investigated for the Flexible Path option was to use a dual launch architecture that could serve a wide variety of exploration goals. The dual launch concept used two medium sized heavy lift launch vehicles for lunar missions as opposed to the single Saturn V architecture used for the Apollo Program, or the one-and-a-half vehicle Ares I / Ares V architecture proposed for the Constellation Program. This dual launch approach was studied as a Flexible Path option for lunar missions and for possible excursions to other destinations like geosynchronous earth orbiting satellites, Lagrange points, and as presented in this paper, asteroid rendezvous. New habitation and exploration systems for the crew are presented that permit crew sizes from 2 to 4, and mission durations from 100 to 360 days. Vehicle configurations are presented that include habitation systems and tools derived from International Space Station (ISS) experience and new extra-vehicular activity tools for asteroid exploration, Figure 1. Findings from these studies and as presented in this paper indicate that missions to near-Earth asteroids appear feasible in the near future using the dual launch architecture, the technologies under development from the Constellation Program, and systems derived from the current ISS Program. In addition, the capabilities derived from this approach that are particularly beneficial to the commercial sector include human access to geosynchronous orbit and the Lagrange points with new tools for satellite servicing and in-space assembly.



Figure 1. The Flexible Path vehicle for asteroid missions includes an ISS derived habitat and the Orion crew exploration vehicle.